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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/605,108	09/09/2003	Dureseti Chidambarao	FIS920030183US1	2107

7590 06/08/2006

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EXAMINER

PHAM, LONG

ART UNIT	PAPER NUMBER
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2814

DATE MAILED: 06/08/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/605,108

Applicant(s)

CHIDAMBARRAO ET AL.

Examiner

Long Pham

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 March 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 16-18,22-28 and 30-39 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 16-18,22-28 and 30-39 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>05/16/06</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Rejections and/or objections necessitated by the amendments

Claims 16 as currently amended, 17, 18, 22, 23, 24, 25, 26, 27, and 28 as previously filed, and claims 30-39 as newly presented, are rejected under 35 U.S.C. 103(a) as being unpatentable over the applicant's admitted prior art of this application (AAPA) in combination with Yoo (US patent 6,200,836).

With respect to claims 16 as currently amended, 17, 18, 22, 23, 24, 25, 26, 27, and 28 as previously filed, AAPA in combination with Yoo teach the claimed invention. **See the rejections of office action dated 12/08/05.**

Further with respect to claim 16 as currently amended, it is submitted that since AAPA in combination with Yoo teach the claimed invention, the resulting low-vacancy regions would inherently and substantially overlap the source and drain extension regions.

With respect to newly presented claim 30, AAPA further teaches forming an Si cap layer on the SiGe based substrate and the tension of the Si cap layer is inherently strained biaxially to match an underlying relaxed SiGe lattice. See [0003] of the Background of the Invention of this application.

With respect to newly presented claim 31, Yoo further teaches forming sidewalls on side surfaces of a gate electrode 14 before ion implanting, whereby the gate electrode is protected from ion implanting. See figs. 1-3 and associated text of Yoo.

With respect to newly presented claim 32, since AAPA in combination with Yoo teach the same process as claimed, the vacancy concentration would be inherently reduced by annihilation of excess vacancies in the source and drain extension regions.

With respect to newly presented claim 33, Yoo further teaches ion implantation of interstitial element after forming the source and extension regions.

However, It would have been obvious to one of ordinary skill in the art of making semiconductor devices to perform ion implantation of interstitial element before forming the source and extension regions because the selection of any order of performing process steps is prima facie obvious in the absence of new or unexpected results. In re Burhans, 154 F.2d 690, 69 USPQ 330 (CCPA 1946).

With respect to newly presented claim 34, Yoo teaches using oxygen as the interstitial element but fails to teach using nitrogen as the interstitial element.

However, the use of nitrogen as interstitial element is well-known in the art.

With respect to newly presented claim 35, since AAPA in combination with Yoo teach the same process as claimed, the interstitial element would inherently create additional interstitials which inherently react with and annihilate excessive vacancies in the SiGe based substrate.

With respect to newly presented claim 36, since AAPA in combination with Yoo teach the same process as claimed, the ion implantation of interstitial element would inherently reduce an N-type impurity in source and drain regions, thereby improving roll-off characteristics.

With respect to newly presented claim 37, Yoo further teaches that the ion implantation is performed in a self-aligned manner by using a gate electrode 14 as a mask. See figs. 1-3 and associated text of Yoo.

With respect to newly presented claims 38 and 39, AAPA further teaches forming an Si cap layer on the SiGe based substrate.

Further with respect to newly presented claims 38 and 39, Yoo in combination with AAPA further teach forming a gate electrode on the Si cap layer.

Further with respect to newly presented claims 38 and 39, AAPA in combination with Yoo further teach forming sidewalls on sides of the gate electrode.

Further with respect to newly presented claims 38 and 39, AAPA in combination with Yoo further teach forming source and drain extension regions in an upper surface of the SiGe substrate.

Further with respect to newly presented claim 38, AAPA in combination with Yoo further teach ion implanting an interstitial element into the source and drain extension regions to inherently reduce vacancy concentration in the source and drain extension regions, wherein the ion implantation occurs after the sidewalls are formed

Further with respect to newly presented claim 38, since AAPA in combination with Yoo teach the claimed invention, the vacancy concentration in the source and drain extension regions would be inherently reduced in order to annihilate excess vacancies or trap vacancies, wherein the ion implantation or reducing occurs after the sidewalls are formed and the formed low-vacancy regions would inherently and substantially overlap the source and drain extension regions.

Response to Arguments

Applicant's arguments with respect to claims 16-18, 22-28, and 30-39 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

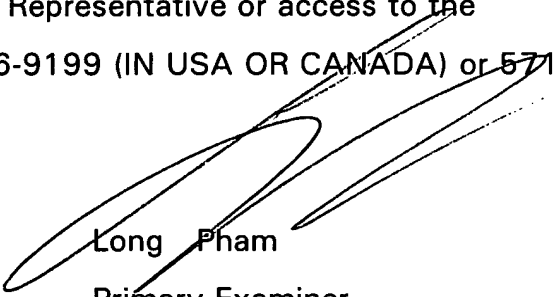
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be

calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Long Pham whose telephone number is 571-272-1714. The examiner can normally be reached on Mon-Frid, 10am to 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on 571-272-1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Long Pham
Primary Examiner
Art Unit 2814

LP